UNITED STATES PATENT AND TRADEMARK OFFICE

APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
10/754,340	01/09/2004	Xiao-an Wang		8332

7590 03/19/2007 XIAO-AN WANG 312 ALEXANDER DR. ALLENTOWN, PA 18104	**EXAMINER** DSOUZA, JOSEPH FRANCIS A

ART UNIT	PAPER NUMBER
2611	

SHORTENED STATUTORY PERIOD OF RESPONSE	MAIL DATE	DELIVERY MODE
3 MONTHS	03/19/2007	PAPER

Please find below and/or attached an Office communication concerning this application or proceeding.

If NO period for reply is specified above, the maximum statutory period will apply and will expire 6 MONTHS from the mailing date of this communication.

PTOL-90A (Rev. 10/06)

	Application No.	Applicant(s)
Office Action Summary	10/754,340	WANG, XIAO-AN
	Examiner	**Art Unit**
	Adolf DSouza	2611

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE <u>3</u> MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.
- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

1)☒ Responsive to communication(s) filed on <u>09 January 2004</u>.

2a)☐ This action is **FINAL**.   2b)☒ This action is non-final.

3)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

4)☒ Claim(s) <u>1 - 26</u> is/are pending in the application.

     4a) Of the above claim(s) _____ is/are withdrawn from consideration.

5)☐ Claim(s) _____ is/are allowed.

6)☒ Claim(s) <u>1 - 23, 25 - 26</u> is/are rejected.

7)☐ Claim(s) _____ is/are objected to.

8)☒ Claim(s) <u>24</u> are subject to restriction and/or election requirement.

Application Papers

9)☐ The specification is objected to by the Examiner.

10)☒ The drawing(s) filed on <u>09 January 2004</u> is/are: a)☐ accepted or b)☒ objected to by the Examiner.

     Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

     Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).

11)☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

12)☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

     a)☐ All   b)☐ Some * c)☐ None of:

       1.☐ Certified copies of the priority documents have been received.

       2.☐ Certified copies of the priority documents have been received in Application No. _____.

       3.☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

     * See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

1) ☒ Notice of References Cited (PTO-892)

2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)

3) ☒ Information Disclosure Statement(s) (PTO/SB/08)
Paper No(s)/Mail Date <u>20070314</u>.

4) ☐ Interview Summary (PTO-413)
Paper No(s)/Mail Date. _____ .

5) ☐ Notice of Informal Patent Application

6) ☐ Other: _____ .

Drawings

1.   The drawings are objected to under 37 CFR 1.83(a). The drawings must show

every feature of the invention specified in the claims. Therefore, the "predetermined

value of said design criterion has been met" must be shown or the feature(s) canceled

from the claim(s). Figs. 6 and 7 show in element 520 only the difference between the

criterion at the current time instant and previous time instant (claim 14). No new matter

should be entered.

Corrected drawing sheets in compliance with 37 CFR 1.121(d) are required in

reply to the Office action to avoid abandonment of the application. Any amended

replacement drawing sheet should include all of the figures appearing on the immediate

prior version of the sheet, even if only one figure is being amended. The figure or figure

number of an amended drawing should not be labeled as "amended." If a drawing figure

is to be canceled, the appropriate figure must be removed from the replacement sheet,

and where necessary, the remaining figures must be renumbered and appropriate

changes made to the brief description of the several views of the drawings for

consistency. Additional replacement sheets may be necessary to show the renumbering

of the remaining figures. Each drawing sheet submitted after the filing date of an

application must be labeled in the top margin as either "Replacement Sheet" or "New

Sheet" pursuant to 37 CFR 1.121(d). If the changes are not accepted by the examiner,

the applicant will be notified and informed of any required corrective action in the next

Office action. The objection to the drawings will not be held in abeyance.

Claim Objections

2.   Claims 1, 17 and 25 are objected to because of the following informalities:

The phrase "at lease" should be changed to "atleast".

Appropriate correction is required.

Election/Restrictions

3.   Restriction to one of the following inventions is required under 35 U.S.C. 121:

I.   Claims 1 – 23, 25 – 26 are drawn to assigning channel tap locations in a

CDMA receiver using a sequential or heuristic method classified in class

375, subclass 136.

II.   Claim 24 is drawn to estimating the strength of interference sources in a

CDMA receiver classified in class 375 subclass 144, 148.

Inventions I and II are related as subcombinations disclosed as usable together in a

single combination. The subcombinations are distinct if they do not overlap in scope

and are not obvious variants, and if it is shown that <u>at least one subcombination is</u>

<u>separately usable</u>. In the instant case, subcombination II has separate utility such as

estimating the strength of interference signals.   See MPEP § 806.05(d).

The examiner has required restriction between subcombinations usable together.

Where applicant elects a subcombination and claims thereto are subsequently found

allowable, any claim(s) depending from or otherwise requiring all the limitations of the

allowable subcombination will be examined for patentability in accordance with 37 CFR

1.104. See MPEP § 821.04(a). Applicant is advised that if any claim presented in a

continuation or divisional application is anticipated by, or includes all the limitations of, a

claim that is allowable in the present application, such claim may be subject to

provisional statutory and/or nonstatutory double patenting rejections over the claims of

the instant application.

Claim Rejections - 35 USC § 102

4.   The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that

form the basis for the rejections under this section made in this Office action:

> A person shall be entitled to a patent unless –
>
> (b) the invention was patented or described in a printed publication in this or a foreign country or in public use or on sale in this country, more than one year prior to the date of application for patent in the United States.

5.   Claims 17 - 20 are rejected under 35 U.S.C. 102(b) as being anticipated by Kutz

et al. (On The Performance Of A Practical Downlink CDMA Generalized Rake

Receiver; which has been provided by the Applicant in his IDS).

Regarding claim 17, Kutz discloses a method of recovering data in a received signal

sent in a communications media (Abstract), comprising:

(a) estimating at lease one composite channel impulse response from said received

signal (page 1355, left column, section 1V, 1st 5 lines);

(b) estimating a set of noise covariances based on said composite channel impulse

responses (page 1353, left column, start of section A – right column, 1st 2 lines);

(c) assigning a set of channel-tap locations by a heuristic search (page 1354, left

column, iterations shown in *italics*. Applicant has admitted that Kutz discloses a heuristic

search method (Specification, page 4, last 3 lines);

(d) computing a set of weight coefficients for said set of channel-tap locations (page

1353, right column, line 12 – Equation (7); wherein the weight coefficients are w);

(e) demodulating data in said received signal with said set of channel-tap locations and

said set of weight coefficients (page 1353, section III up to start of section A; wherein

demodulating the data is done by the Rake receiver output, the tap locations are

specified by the time delays d^i_j, and the weights are as shown in Equation 5).

Regarding claim 18, Kutz discloses the heuristic search comprises:

(a) pre-selecting a first set of channel-tap locations (page 1354, left column, lines 5 – 6;

wherein pre-selecting a first set of tap locations is done by positioning the first L fingers

on the L multipaths);

 (b) selecting a second set of channel-tap locations in said search region by a heuristic

search scheme (page 1353, iterations shown in *italics)*.

Regarding claim 19, Kutz discloses pre-selecting said first set of channel-tap locations

comprises choosing a number of strongest channel taps according to said composite

channel impulse response, the distances among which are equal to or larger than a predetermined minimum distance (page 1354, left column, 1st 5 lines).

Regarding claim 20, Kutz discloses heuristic search scheme comprises choosing a number of channel taps, where the distance of a thus-chosen channel tap to another thus-chosen channel tap or to a pre-selected channel tap equals to the distance between a pair of pre-selected channel taps (page 1353, steps in *italics*; steps 1 and 3; wherein the new tap is set according to the difference between two previously set locations).

Claim 21 is similarly analyzed as claim 20.

Regarding claim 22, Kutz discloses heuristic search scheme comprises choosing a number of channel taps, where a thus-chosen channel tap is the mirror image of a pre-selected channel tap with respect to another pre-selected channel tap (page 1353, right column, line starting with "Let us consider a two-ray channel ...." – page 1354 ,1st 2 lines; wherein the mirror image region is the symmetrical position that is used).

Claim Rejections - 35 USC § 103

6.   The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

> (a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negatived by the manner in which the invention was made.

7.   Claims 1, 3, 5, 7, 9, 10, 15, 25 are rejected under 35 U.S.C. 103(a) as being

unpatentable over Kutz et al. (On The Performance Of A Practical Downlink CDMA

Generalized Rake Receiver) in view of Wang et al. (US 20010028677; which has been

provided by the Applicant in his IDS).

Regarding claim 1, Kutz discloses a method of recovering data in a received signal sent

in a communications media (Abstract), comprising:

(a) estimating atleast one composite channel impulse response from said received

signal (page 1355, left column, section 1V, 1st 5 lines);

(b) estimating a set of noise covariances based on said composite channel impulse

response (page 1353, left column, start of section A – right column, 1st 2 lines);

 (d) computing a set of weight coefficients for said set of channel-tap locations (page

1353, right column, line 12 – Equation (7); wherein the weight coefficients are w);

(e) demodulating data in said received signal with said set of channel-tap locations and

said set of weight coefficients (page 1353, section III up to start of section A; wherein

demodulating the data is done by the Rake receiver output, the tap locations are

specified by the time delays d^i_j, and the weights are as shown in Equation 5).

Kutz does not disclose (c) assigning a set of channel-tap locations by a sequential

search.

In the same field of endeavor, however, Wang discloses (c) assigning a set of channel-tap locations by a sequential search (Fig. 9; page 8, paragraph 82 – page 9, paragraph 85; wherein the sequential search is done as shown in Fig. 9).

Therefore it would have been obvious to one having ordinary skill in the art, at the time the invention was made, to use the method, as taught by Wang, in the system of Kutz because this would enable tap locations be selected based on the SNR being maximized, as disclosed by Kutz.

Regarding claim 3, Kutz discloses sequential search comprises:

(a) determining a search region (page 1353, right column, section B, line starting with "It is suggested ... ")

(b) pre-selecting a first set of channel-tap locations in said search region if said first set is predetermined to be non-empty (page 1354, left column, lines 5 – 6; wherein pre-selecting a first set of tap locations is done by positioning the first L fingers on the L multipaths);

The limitation regarding "sequentially selecting a second set of channel-tap locations in said search region to optimize a design" is analyzed as in claim 1 above.

Regarding claim 5, Kutz discloses the search region is a union of a set of path regions and a set of mirror image regions (page 1353, right column, line starting with "Let us consider a two-ray channel ...." – page 1354 ,1st 2 lines; wherein the mirror image region is the symmetrical position that is used).

Regarding claim 7, Kutz discloses pre-selecting said first set of channel-tap locations comprises choosing a number of strongest channel taps according to said composite channel impulse response, the distances among which are equal to or larger than a predetermined minimum distance (page 1354, left column, 1st 5 lines).

Regarding claim 9, Kutz discloses said design criterion is signal-to-noise ratio (page 1353, right column, line starting with "It is suggested ..." – line ending with " ...the best place to position additional finger would be ..").

Regarding claim 10, Kutz does not disclose selecting the second set of tap locations optimizes design criterion based on a recursive evaluation.

In the same field of endeavor, however, Wang discloses sequentially selecting said second set of channel-tap locations to optimize said design criterion comprises choosing a new channel-tap location that optimizes said design criterion based on a recursive evaluation that explicitly depends on: (a) a set of previously evaluated functions of all previously chosen channel-tap locations, and (b) a set of functions of said new channel-tap location, whereby said recursive evaluation can reduce the amount of computations (Fig. 9; page 8, paragraph 82 – page 9, paragraph 85; wherein the sequential search is done as shown in Fig. 9; wherein the second set of tap locations is as shown in Fig.9, optimizing the design criterion is interpreted as maximizing the SNR, the previously evaluated function of previous tap locations is interpreted as the SNR_{max} that was computed in the past iterations, the set of function for the new tap location is interpreted as the new SNR that computed for this iteration).

Therefore it would have been obvious to one having ordinary skill in the art, at the time the invention was made, to use the method, as taught by Wang, in the system of Kutz because this would enable tap locations be selected based on the SNR being maximized, as disclosed by Kutz.

Regarding claim 15, Kutz does not disclose terminating the sequential selection if a predetermined value of said design criterion has been met.

In the same field of endeavor, however, Wang discloses sequentially selecting said second set of channel-tap locations to optimize said design criterion can be terminated early before a pre-determined number of channel-tap locations has been selected, if a predetermined value of said design criterion has been met (page 9, continuation of paragraph 82, lines 6 – 9; wherein the termination is done when the SNR does not increase by certain amount).

Therefore it would have been obvious to one having ordinary skill in the art, at the time the invention was made, to use the method, as taught by Wang, in the system of Kutz because this would simplifying the processing, as stated by Wang and also obvious to one of ordinary skill in the art.

Claim 25 is similarly analyzed as claim 1.

8.   Claims 4, 6 are rejected under 35 U.S.C. 103(a) as being unpatentable over Kutz et al. (On The Performance Of A Practical Downlink CDMA Generalized Rake Receiver) in view of Wang et al. (US 20010028677; which has been provided by the

Applicant in his IDS) and further in view of Bottomley et al. (A Generalized RAKE

Receiver For Interference Suppression; IEEE Journal on Selected areas in

Communications; Vol. 18, No.8; August 2000; pages 1536 – 1545).

Regarding claim 4, the combined invention of Kutz and Wang does not disclose that the

search region also comprises a pre-channel-impulse-response section, and a post-

channel-impulse-response section.

In the same field of endeavor, however, Bottomley discloses search region is a

contiguous region comprising a span of the channel impulse response, a pre-channel-

impulse-response section, and a post-channel-impulse-response section (page 1540,

right column, paragraph just before section C).

Therefore it would have been obvious to one having ordinary skill in the art, at the time

the invention was made, to use the method, as taught by Bottomley, in the combined

system of Kutz and Wang because this would allow all potential delays to be found, as

disclosed by Bottomley.

Regarding claim 6, the combined invention of Kutz and Wang does not disclose search

region is a union of a set of path regions.

In the same field of endeavor, however, Bottomley discloses search region is a union of

a set of path regions (page 1540, right column, paragraph just before section C;

wherein the union is the region before and after the multipath region plus the multipath

region).

Therefore it would have been obvious to one having ordinary skill in the art, at the time the invention was made, to use the method, as taught by Bottomley, in the combined system of Kutz and Wang because this would allow all potential delays to be found, as disclosed by Bottomley.

9.   Claims 8 is rejected under 35 U.S.C. 103(a) as being unpatentable over Kutz et al. (On The Performance Of A Practical Downlink CDMA Generalized Rake Receiver) in view of Wang et al. (US 20010028677; which has been provided by the Applicant in his IDS) and further in view of Yellin (US 6,618,433).

Regarding claim 8, the combined invention of Kutz and Wang does not disclose the design criterion is mean square error.

In the same field of endeavor, however, Yellin discloses the design criterion is mean square error (column 14, lines 35 - 46).

Therefore it would have been obvious to one having ordinary skill in the art, at the time the invention was made, to use the method, as taught by Yellin, in the combined system of Kutz and Wang because this would enable the delays to be determined by using the MSE, as disclosed by Yellin.

10.   Claims 16, 23 and 26 are rejected under 35 U.S.C. 103(a) as being unpatentable over Kutz et al. (On The Performance Of A Practical Downlink CDMA Generalized

Rake Receiver) in view of Wang et al. (US 20010028677; which has been provided by the Applicant in his IDS) and further in view of Dabak et al. (US 6,345,069).

Regarding claim 16, the combined invention of Kutz and Wang does not disclose the receiver uses 2x over sampling.

In the same field of endeavor, however, Dabak discloses recovering data in said received signal sent in a communications media is performed at 2 X over sampling (column 3, line 61 – column 4, line 2) .

Therefore it would have been obvious to one having ordinary skill in the art, at the time the invention was made, to use the method, as taught by Dabak, in the combined system of Kutz and Wang because this would provide a comprise between accuracy, circuit complexity and power consumption, as disclosed by Dabak.

Claims 23 and 26 are similarly analyzed as claim 16.

Allowable Subject Matter

11.   Claims 2, 11 – 14 are objected to as being dependent upon a rejected base claim, but would be allowable if rewritten in independent form including all of the limitations of the base claim and any intervening claims.

Other Prior Art Cited

The prior art made of record and not relied upon is considered pertinent to the

applicant's disclosure.

The following patents are cited to further show the state of the art with respect to Rake

receivers:

> Bottomley (US 5,506,861) discloses System and method for joint demodulation
>
> of CDMA signals.

> Dent et al. (US 5,572,552) discloses Method and system for demodulation of
>
> downlink CDMA signals.

> Bottomley (US 6,363,104) discloses a Method and apparatus for interference
>
> cancellation in a rake receiver.

> Schelm et. al.   (US 20030235238) discloses Multipath channel tap delay
>
> estimation in a CDMA spread spectrum receiver.

Contact Information

Any inquiry concerning this communication or earlier communications from the

examiner should be directed to Adolf DSouza whose telephone number is 571-272-

1043. The examiner can normally be reached on Monday through Friday from 8:00 AM
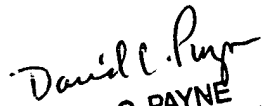
to 5:00 PM EST.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's

supervisor, David Payne can be reached on 571-272-3024. The fax phone number for

the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of an application may be obtained from the

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For more information about the PAIR system, see http://pair-direct.uspto.gov. Should

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USPTO Customer Service Representative or access to the automated information

system, call 800-786-9199 (IN USA OR CANADA) or 571-272-1000.

Adolf DSouza
Examiner
Art Unit 2611

AD

DAVID C. PAYNE
SUPERVISORY PATENT EXAMINER